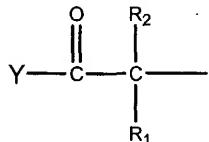


What Is Claimed Is:

- 1 1. A acrylonitrile block copolymer comprising —A—(B)_m—,
2 wherein A is represented by the following formula:



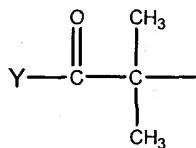
3 wherein

4 Y is a radical remaining after removal of the hydrogen atom of
5 a terminal hydroxy (OH) functional group of a polyester;
6 R₁ and R₂ represent alkyl, aryl, alkylaryl, aralkyl, aminoalkyl,
7 alkylamino, alkoxy, or alkoxy aryl groups;
8 B represents acrylonitrile or its methyl derivative monomer;
9 and
10 m is an integer from 20 to 10,000.

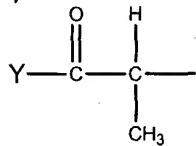
- 1 2. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein the polyester radical Y is polycaprolactone,
3 polyvalerolactone, polybutyrolactone, polylactide or their copolymer
4 radical.

- 1 3. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein B is methacrylonitrile monomer.

- 1 4. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein A is



3 or



4

1 5. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein a number average molecular weight (Mn) of A is about 10³ -
3 10⁵, and a number average molecular weight (Mn) of (B)_m is about 10³
4 - 3×10⁵.

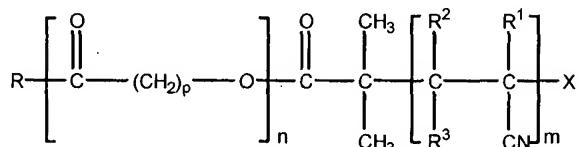
1 6. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein PDI of A is about 1.05 - 2.0.

1 7. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein PDI of A is about 1.05 - 1.5.

1 8. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein a number average molecular weight of the acrylonitrile block
3 copolymer is about 1.05 - 2.0.

1 9. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein a number average molecular weight of the acrylonitrile block
3 copolymer is about 1.05 - 1.5.

1 10. The acrylonitrile block copolymer as claimed in claim 1,
2 wherein the acrylonitrile block copolymer is represented by the
3 following formula:



4 wherein R¹, R² and R³ are the same or different and are H or CH₃;

5 R is any alkyl, aryl, alkoxy, or arylalkoxy group; p is
6 an integer from 4 to 7; n is an integer from 20 to 2000.

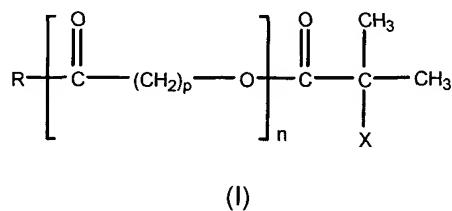
1 11. A cross-linking agent, surfactant, compatibilizer or
2 dispersant comprising the acrylonitrile block copolymer as defined
3 in claim 1.

1 12. A method for producing an acrylonitrile block copolymer,
2 the acrylonitrile block copolymer comprising —A—(B)_m—, wherein (B)_m
3 is a polyacrylonitrile block and A includes a polyester block and
4 a linking group linking the polyester block and the polyacrylonitrile
5 block, wherein B is an acrylonitrile or its derivative monomer, the
6 method comprising:

7 halogenating a terminal group of a polyester to form a
8 macroinitiator; and

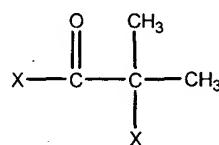
9 contacting the macroinitiator with acrylonitrile or its
10 derivative monomers by controlled radical polymerization.

1 13. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the macroinitiator is



3 wherein R is benzyloxyl ($\text{C}_6\text{H}_5\text{CH}_2\text{O}$), or isopropoxyloxy
4 ((CH_3)₂ CH)₂ O); p is an integer from 4 to 7; n is an integer
5 from 20 to 2000.

1 14. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the macroinitiator (I) is prepared
3 by mixing the polyester and an organic compound, or a Lewis basic
4 compound in a solvent, and is halogenated reacting with an organic
5 halide represented by the following formula:

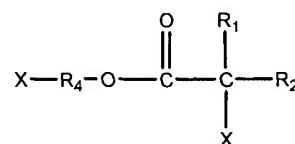


6 wherein, X is halogen and the two X are the same or different.

1 15. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 14, wherein the organic compound used to prepare
3 the macroinitiator is triethylamine (NEt_3) or pyridine.

1 16. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the polyester block is polycaprolactone,
3 polyvalerolactone, polybutyrolactone or polylactide block.

1 17. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the macroinitiator is prepared by
3 mixing the polyester and an organic compound, or a Lewis basic compound
4 in a solvent, and is halogenated with a halide represented by the
5 following formula:



6 wherein X is halogen, the two X are the same or different, and
7 R_4 is alkyl, aryl, alkylaryl, aralkyl, aminoalkyl,
8 alkylamino, alkoxy, or alkoxy aryl group.

1 18. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the controlled radical polymerization
3 used to react the macroinitiator with the acrylonitrile or its
4 derivative monomers is atom transfer radical polymerization (ATRP).

1 19. The method for producing the acrylonitrile block copolymer
2 as claimed in claim 12, wherein the acrylonitrile monomer's derivative
3 is methacrylonitrile.

1 20. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 12, wherein a number average molecular
3 weight (M_n) of the polyacrylonitrile block is about 10^3 - 3×10^5 .

1 21. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 12, wherein the macroinitiator contacts
3 with acrylonitrile or its derivative monomers in the presence of a
4 mixture including a metal catalyst and a solvent.

1 22. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 21, wherein the metal catalyst is consisted
3 of a metal compound MX_q and an organic ligand, M is a transition metal,
4 X is a halogen or pseudohalogen, q is the valence of the transition
5 metal.

1 23. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 22, wherein M is Fe, Co, Ni, Cu, Rh,
3 Ir, Pd, Pt, Ru or Re.

1 24. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 22, wherein the pseudohalogen is —NCS,
3 —NCO, —SCN, —CN, —N₃, —SO₄, carboxylate group, or —NO₂.

1 25. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 22, wherein the organic ligand is
3 bipyridine, triphenylphosphine, 2-pyridyl diphenylphosphine or an
4 organic compound containing multiple nitrogen atoms, and a molar ratio
5 of organic ligand to metal is 1 - 4.

1 26. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 25, wherein the organic compound
3 containing multiple nitrogen atoms is PMDETA
4 (pentamethyldiethylenetriamine).

1 27. The method for producing the polyacrylonitrile block
2 copolymer as claimed in claim 21, wherein the solvent is ethylene
3 carbonate, propylene carbonate, butylene carbonate, dimethyl
4 formamide (DMF) or hexafluoro isopropanol.